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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

FORD, NATHAN K

ART UNIT

PAPER NUMBER

1712

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/580,771	Applicant(s) TOMPA ET AL.	
	Examiner NATHAN K. FORD	Art Unit 1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-70 is/are pending in the application.
- 4a) Of the above claim(s) 36-58 and 61-70 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-35, 59 and 60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>5/26/06</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Election

Applicant's election of Group I, claims 1-35, 59-60, in the reply filed July 20, 2010, is acknowledged. Claims 36-58, 61-70, are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 4, and 21-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Hintermaier et al., US 6,133,051.

Claim 1: Hintermaier describes a flash MOCVD system comprising (Fig. 3):

- A reaction chamber (352);
- A substrate assembly (361) positioned within the reaction chamber;
- A flash evaporator (330) for vaporizing a reactant material (6, 37-40);
- A gas distribution system (360) (7, 1-13).

Claim 2: The vaporizer heats the reactant material (6, 43-50).

Claim 4: The composition of the reactant material is drawn to the intended use of the apparatus, wherein a recitation concerning the manner in which a claimed apparatus is to be employed does not differentiate the apparatus from prior art satisfying the claimed structural limitations (*Ex parte Masham*, 2 USPQ2d 1647). The apparatus is capable of being charged with whatever reactant species satisfies the needs of the instant process.

Claims 21-23, 26: These claims are also drawn to the intended use of the apparatus. The apparatus is capable of being used in such a manner as to fabricate films of lithium niobate of any form.

Claim 24-25: The gas distribution system controls film uniformity (10, 17-20).

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Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Versteeg et al., US 5,451,260.

Hintermaier's evaporator does not avail ultrasonic techniques to vaporize the reactant material but instead uses heat. Even so, the former method is well-known in the art. Versteeg, for instance, describes an MOCVD system having a flash evaporator which ultrasonically vaporizes the precursor. This technique is advantageous as the use of an ultrasonic atomizing nozzle ensures that only vapor comes into contact with the substrates (2, 1-13). It would have been obvious to the skilled artisan to vaporize Hintermaier's reactants ultrasonically to ensure complete vaporization.

Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Kirlin et al., US 5,711,816.

Claims 5-6: Hintermaier does not address the constitution of the flash evaporator. (The reference does, however, teach a vessel (310) for containing a liquid precursor and a pump (320) for providing a controlled flow of the liquid precursor solution (6, 32-40).) In supplementation, Kirlin discloses an exemplary evaporator comprising an evaporation chamber (21) and a heating device (26) arranged in said chamber (7, 15-50). It would have been obvious to incorporate a heating device within Hintermaier's flash evaporator to achieve the predictable result of evaporating a precursor.

Claim 7: The heating device is capable of being maintained at a temperature that precludes condensation.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Versteeg and in further view of Jen et al., US 5,135,295, and Toda et al., US 2004/0020437.

Versteeg, introduced under the rejection of claim 3, further describes piezoelectrically operated ultrasonic atomizing nozzles (3, 3-15; Fig. 1). Versteeg does not address a device for heating cooling. However, Jen attests that when the temperature of a piezoelectric material is above its Curie threshold, the piezoelectricity disappears even after

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cooling (1, 41-43). Accordingly, Versteeg demonstrates an implicit need maintain the temperature of the piezoelectric nozzle below its Curie temperature. Toda is cited for the demonstration of an exemplary means to heat and cool an MOCVD vaporizer. To modulate the temperature of the vaporizer, the reference avails cooling passages (18) for flowing a cooling gas therethrough and a heater. It would have been obvious to incorporate cooling passages and a heater within Versteeg's vaporizer in order to maintain the temperature below the Curie threshold.

Claims 9-12, 14, 17, and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Chou et al., US 2004/0103844, Dhindsa et al., US 6,245,192, and Nakatsuka, US 6,599,367.

Claims 9-11, 14, 59: Hintermaier is silent concerning the constitution of the gas distribution system. In supplementation, Chou teaches an exemplary gas distribution system which provides enhanced deposition uniformity [0007]. With reference to Figure 3, the gas distribution system comprises a concentric zone distribution section (205) and a first flow homogenizer (206). It would have been obvious to incorporate this showerhead configuration within Hintermaier's system to achieve the predictable result of deposition uniformity.

Chou does not disclose a second flow homogenizer or a cooling section. Dhindsa, however, discloses a showerhead having two flow homogenizers (56A, B) and a cooling section (74) therebetween (Fig. 4). The arrangement of multiple vertical plenums effects a more uniform process gas pressure distribution (2, 60-65). In light of this teaching, it would have been obvious to affix a second flow homogenizer to Chou's showerhead apparatus to create multiple plenums in order to promote the desirable result of uniform gas pressure distribution. Further, Dhindsa provides a gas channel to the cooling section, which can be used to distribute a cooling gas.

The above references do not address the relative densities of the holes in the homogenizer plates. Nakatsuka discloses a showerhead arrangement having a plurality homogenizers, wherein the density of the holes in the upper two homogenizers (84, 86) are greater than the lowest homogenizer (80) (6, 30-42), thereby demonstrating the suitability of this configuration for the purpose of promoting deposition uniformity (2, 55-63). Accordingly, it would have been obvious to reconfigure the density of the upper homogenizer in manner described by Nakatsuka to achieve the predictable result of film uniformity.

Claim 12: With reference to Figure 3 of Chou, the zone distribution section is bisected into two zones into which two distinct gases are provided.

Claim 17: The embodiment of Dhindsa incorporated above includes a plenum (20) disposed above the zone-distribution section. The pressure can be adjusted merely by modulating the incoming gas flow.

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Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Chou, Dhindsa, and Nakatsuka, and in further view of Ayers, US 6,395,093.

The cited prior art does not address the rotation of the substrate. Ayers, however, attests that it would have been obvious to rotate the substrate in order to promote uniform deposition (3, 48-57). For this reason, it would have been obvious to one of ordinary skill to rotate the substrate in Hintermaier's apparatus.

Claims 15-16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Chou, Dhindsa, and Nakatsuka, and in further view of McFeely et al., US 2005/0260833.

Claims 16, 18: The prior art does not address the transparencies of the homogenizers. McFeely, however, states firstly that it is well-known in the art to employ a showerhead having a highly reflective surface [0004]. Secondly, the reference states that because deposits form on the bottom surface of the showerhead which alters its emissivity, it becomes obvious to form a coating on the showerhead to obviate unwanted emissivity fluctuations [0016]. According to the first statement it would have been obvious to employ a reflective showerhead to reflect heat back to the substrate to facilitate its heating.

Claim 15: According to the second statement above, it would have been obvious to one of ordinary skill to coat the lower homogenizer plate with a substance which resists emissivity change since it is the lower plate that is most susceptible to byproduct deposits. By coating the lower plate, the transparency of this plate will be altered relative to the upper homogenizer plate, thereby satisfying the claim.

Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Costello et al., US 2002/0017916.

Hintermaier does not address the constitution of the substrate holder. Costello remedies this deficiency by disclosing a substrate support which precisely regulates substrate temperature by providing a heating coil (34) and cooling channels (44) [0054]. It would have been obvious to one of ordinary skill to incorporate heating coils and cooling channels in order to modulate substrate temperature.

Claims 27-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Okase et al., US 6,228,173.

Claims 27-28, 31, 35: Hintermaier does not locate the MOCVD system described above within a cluster tool system. Nevertheless, it is well-known in the art to group several chambers in a cluster arrangement to accelerate pro-

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cessing and augment yield. Figure 1 of Okase, for instance, delineates precisely this arrangement: Two deposition apparatuses (4, 6) are interconnected by a load lock system (14) (4, 45ff). In addition, the system comprises two annealing chambers (8, 10). In light of this teaching, it would have been obvious to one of ordinary skill to duplicate Hintermaier's MOCVD chambers and configure them in a cluster arrangement in order to increase throughput (2, 10-13).

Lastly, the examiner acknowledges that Okase's deposition apparatuses (4, 6) are designated as CVD rather than MOCVD chambers. Nevertheless, it is the Office's opinion that one of ordinary skill could readily appreciate that the advantages of arranging process chambers in a cluster architecture, i.e., to augment throughput, are realizable not only in CVD systems but in MOCVD systems as well.

Claims 29-30, 32-34: These claims are drawn to the intended use of the apparatus. The cited prior art is fully capable of forming the film-types recited in these claims.

Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hintermaier in view of Chou, Dhindsa, and Nakatsuka, and in further view of Schlottmann, US 2004/0123800.

The cited prior art does not address how the through-holes of the showerhead are formed. Schlottman, however, attests that it is known in the art form holes in a showerhead through the technique of drillings, and identifies several examples of the technique being used [0006]. In view of this disclosure, it would have been obvious to one of ordinary skill to form holes in a flow homogenizer via drilling.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan K. Ford whose telephone number is 571 270 1880. The examiner can normally be reached on M-F, 8:30-5:00 EDT. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland, can be reached at 571 272 1418. The fax phone number for the organization where this application or proceeding is assigned is 571 273 8300.

/N. K. F./

Examiner, Art Unit 1712

/Karla Moore/

Primary Examiner, Art Unit 1716